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THE PLAGUE.

I.

THE RECENT AND PRESENT OUTBREAKS IN HONG-KONG
AND INDIA.

BY EDWARD F. WILLOUGHBY, M.D.,
OF LONDON.

THE plague, a name not likely to be superseded, bears a strong resemblance in its etiology and pathology to typhus, in the severer cases of which petechiæ, hemorrhages, and even the most characteristic phenomenon of the former disease—glandular inflammations—may be met with. It is often called bubonic plague, but inaccurately, since in a minority only, indeed, if we recognize the “*pestis minor*” as a “*pestis metior*” differing chiefly in severity, in a very small minority of cases does suppuration occur. Known to the Greek physicians, and introduced into Europe in the sixth century, if not earlier, for more than a thousand years it from time to time decimated the nations, but disappeared from Great Britain about the end of the seventeenth century, and from Western, Southern, and Central Europe toward the close of the eighteenth century; though Malta was involved in a Levantine epidemic in 1813, and it lingered on the lower Danube and the shores of the Black Sea until 1840, while Russia has been frequently, and quite recently, invaded *via* Astrakhan.

It is endemic in Arabia, Syria, the Euphrates Valley, Persia, Central Asia, and Southern China, whence it has within the present century made inroads along the northern coast of Africa, across the Himalayas, and into some of the islands of the far East, but has never approached the equator or crossed the oceans on either side. Like typhus, it follows wars and famines, and is favored by poverty, filth, and overcrowding;

conditions, be it remembered, by no means necessarily connoting density of population; existing, indeed, in far more aggravated degrees on the bleak steppes of Turkistan than in the populous cities of the Ganges Valley, though unknown in equatorial regions, where men can find food without labor, and clothes and houses are rather inconveniences than otherwise.

Aryans, Semites, and Mongols have suffered alike at different times, and the facts that Europeans in Asia enjoy comparative immunity, and that it has never prevailed as an epidemic in India save in years of famine, seem to point to social conditions rather than to racial differences in explanation of its geographical distribution, both in the present and in the past, unless it be true that the Japanese, the cleanest people in the world, are as susceptible as the Chinese, who are the filthiest of civilized races; but this is doubtful, since two of the three Japanese medical men who were attacked in Hong-Kong contracted it apparently by inoculation in the post-mortem room, while the Chinese hospital assistants, conforming to European habits, escaped.

Its prevalence in the Chinese province of Yunnan excited no attention; but Hong-Kong was invaded from Canton in 1894 and in 1896, and some cases occurred in Singapore and Borneo. On each occasion the incidence of the disease was mainly on the Chinese population, among whom the case-mortality in 1894 could not have been much under 100 per cent.—that among the hospital patients having been 93 per cent., and no account having been taken of the numerous dead bodies found daily in the streets. In 1896, whether from the disease being of a milder type, or, as is more probable, from better medical and sanitary measures, the total mortality among the Chinese was 89 per cent. of the persons attacked, whether in the hospitals or in their homes, but the European colony suffered more than in 1894. In that year the only Europeans attacked were the soldiers of the Shropshire Regiment, who volunteered to assist the municipal authorities in scavenging and sanitary work, in which they were exposed to the inhalation of highly infected dust; the medical and nursing staff escaped entirely, the two sisters of the Italian convent who succumbed having been Eurasians coming from very poor homes, and the three Japanese medical men, one of whom died, having been engaged in post-mortem examinations and pathological research. In 1896 the cases other than Chinamen were only twenty-two, viz., six Europeans, with four deaths; fifteen Indians, with six deaths; and one native of Siam, who died. Two of the Europeans were nursing-sisters, an English and an Italian lady, the latter dying.

As to the susceptibility of the lower animals to the plague there is some difference of opinion; but this much is certain, that while it has never been observed in cattle, jackals, dogs, and pigs are attacked after devouring corpses, which in China are often left exposed. In Hong-

Kong, on the other hand, the dogs did not suffer because the dead were promptly buried by the authorities, if not by their friends. Rats, however, are attacked in every place, not only during an epidemic, but before the disease appears among the population, so constantly indeed that in China and among the Himalayan tribes one of the names by which it is known is that of "rat's disease," and it is remarkable that the first cases in Bombay were among the coolies employed in unloading ships from China and in the granaries. How far the rats act as intermediaries or vehicles of infection, and whether they in the first contract the disease from man, or *vice versa*, are at present matters of speculation.

In endeavoring to trace the origin of an epidemic, especially of any disease which, like cholera, yellow fever, smallpox, or that under consideration, is apt to be introduced into a community from without, and in devising measures for preventing its importation or its spread, it is necessary to have an accurate conception of the means and vehicles of infection and of the incubation and infective periods.

There is no doubt that the incubation-period is short—not exceeding a week. Dr. Lowson puts it at three to six days, while Dr. Aoyama is inclined to extend the time by a day at each end. How long after recovery a patient is liable to communicate the infection to others is not, I believe, determined. As to the mode of infection, we must at once dismiss from our minds the ghastly mediæval tales of inevitable contagion and certain death, which would paralyze all human effort. Not that we need discredit them, for we see them repeated in the widespread and appalling case-mortality which still prevails whenever the plague obtains a foothold among peoples, who, whether habitually or under the stress of famine, whether in the city or desert, and in whatever climate, herd together in mud-floored hovels, reeking with filth within and without, dirty in their persons and clothes, and with insufficient, coarse and sour, or unwholesome food. The conditions of the poorer classes in the cities of Europe in the middle ages, and even in some until the beginning of the last, perhaps I might have said present, century, were little, if at all, better than those which are now met with among Arabs, Kurds, and Chinese; but *tempora mutantur et nos mutamur in illis*. Within the last fifty years many physicians, as Drs. Bartoletti, Cabiadis, and Lowson, in Turkey, Tripoli, and Hong-Kong, respectively, have treated—nay, handled—thousands of patients with impunity, though for the most part in well-ventilated hospital-sheds; whereas hundreds of Russian army surgeons fell victims to the typhus so called, though it was probably the plague (if, indeed, there be any essential and specific difference between these diseases), in the campaigns of 1828 and 1876 on the Danube and in Armenia, where, as in so many wars, the medical and commissariat arrangements were wholly unequal to the strain. Theories of a tainted atmosphere and of infection by the breath or by exhalations from the

bodies of the sick were satisfactory enough so long as the poison was supposed to be a subtle emanation, whether of telluric or of animal origin; but, like the hypothesis of the "distal aërial diffusion" of smallpox, are scarcely compatible with the recognition of contagia as ponderable, particulate living bodies, requiring a liquid or moist surface for their growth, though capable of retaining their vitality when desiccated and floating in the air as dust, and to resuscitate and resume their activity when inhaled or ingested. In fact, inhalation of infected dust, handling of fomites, and "eating with" soiled and "unwashed hands," are the real and actual modes of infection commonly spoken of as aërial or by contact. Thus, while the medical men and all but four of the nurses in attendance on the sick at Hong-Kong from 1894 to 1896 escaped entirely, the victims were almost exclusively among the soldiers engaged in shovelling the filth from the floors of infected houses and in tipping it from the carts for burning; and when the removal was not commenced until the filth had been saturated with the acid liquid used for evolving chlorine this operation ceased to be attended with danger. None of those who removed the corpses for burial, carrying them by their pigtails and feet and avoiding contact with their soiled clothing, were attacked.

I have already alluded incidentally to a mild and more chronic form of disease known as the "pestis minor," which appears to keep alive the infection and to serve as a connecting-link between the great epidemics. It is marked by the same disseminated adenitis as the typical plague, and by a certain amount of fever; though it runs a course of indefinite duration, and, as a rule, terminates in recovery, unless, as sometimes happens, after many days or even weeks, during which the patient has perhaps been scarcely conscious of being ill, it suddenly develops into an attack of unmistakable and probably fatal plague. It is true that no such dimorphism is known in the case of the other acute specific diseases, as smallpox, scarlatina, etc.; but I think that we have a strictly parallel phenomenon presented in the relation of farcy to glanders, in which modern pathologists recognize but a chronic and an acute form of one and the same disease, the identical bacillus being present in each; and since the discovery by Kitasato of the specific bacillus of the plague in the acute cases at Hong-Kong two years ago, it has been identified by several observers in cases of the minor or chronic disease, though apparently attenuated and of less toxicity. This discovery is of the utmost interest and importance, serving to explain the recent instances of the introduction of the plague into Calcutta, and still more the occurrence of two cases on board vessels in the Thames, for which one must otherwise have had recourse to conjectural fomites, or to the unwarrantable hypothesis of an extraordinarily prolonged incubation. This dimorphism, as I have termed it, is, of course, a

wholly different phenomenon from that of the mild and unrecognized cases of cholera, diphtheria, and scarlatina, which frequently usher in an epidemic of these diseases, arousing no suspicion of the danger until it is too late to avert it, and baffling endeavors to trace the disease to its origin. But long ago, on purely clinical and etiological grounds, Foderé at Marseilles in 1820, Tholazon in Persia in the sixties, Dickson in Bagdad, and others more recently recognized the connection, Foderé expressing the decided opinion that the pestis minor, benign and non-fatal though it was, "was not less the plague and no less merited the attention of physicians and of magistrates," a position now confirmed by bacteriology and clinical observation.

The first official announcement of the appearance of the plague in Bombay was at the meeting of the sanitary committee on September 23d, when Dr. Viegas stated that it had been present in the city for a fortnight; but it must have been recognized by the native population for two or three months, since pilgrimages to propitiate the goddess of this disease had been organized in the Maudvie, a suburb inhabited by the poorest class. Bombay is in every respect the very opposite of Hong-Kong, which is built on a lofty granite rock, with an unimpeachable water-supply, and in the European quarters a separate system of sewerage with steep gradients, being, in fact, a model of sanitary perfection. There not only the European civil population but their Chinese servants enjoyed absolute immunity. Bombay, on the other hand, lies low, the sewers are defective, with insufficient fall, the soil is sewage-sodden, and the city surrounded by swamps. In November the disease, which had seemed to be abating, revived and the mortality steadily rose; but the official returns, which gave the total deaths up to the middle of January as 2500, are certainly grossly below the truth. Segregation of infected houses and persons was tried, and relaxed or abandoned by turns, and, as might have been expected, with little or no success; seeing that a "house" in the poorer native quarters contains three hundred to six hundred or even more occupants. The fears and prejudices of the people led them to conceal the existence of the disease, while the native medical men, and even the European, yielding to the entreaties of the friends, certified the deaths as "remittent fever," "pneumonia," etc. That in December fifty deaths occurred daily from remittent fever in an urban population is utterly incredible, or that, in the absence of any epidemic of cholera or other disease than the plague, the general death-rate of the city should have risen to between four and five times its normal figure, save from this one cause, is inconceivable. Nor have the Europeans escaped, several deaths having already occurred not only among medical officers, but among civilians. A general exodus of the native population threatens to spread the plague throughout the famine-stricken provinces, and already several hundred deaths

have been reported from Karachi, the second largest seaport on the west coast, and a considerable number at Poonah, which is usually deemed a very healthy station; while "sporadic" cases are cropping up on all sides. From Calcutta conflicting accounts are received; since the arrival last October of a case of *pestis minor* (?) from Bombay, which shortly assumed a typical character, many have been reported, either as plague or *bubon d'emblée*, or under other more or less equivocal denominations. The bacillus of the plague has been identified in several of these; but the disease is at any rate of a milder type, and with a far lower mortality than at Bombay. The men of the Shropshire Regiment which did such noble service at Hong-Kong, and is at present stationed at Calcutta, have suffered extensively from non-venereal buboes. The sanitary conditions of Calcutta, especially in the native quarter, are even worse than those of Bombay, so that the outlook is grave in the extreme should the disease assume a severer character. The approaching pilgrimage of devout Mussulmans to Mecca and other holy places is calculated to give cause for serious alarm as to the propagation of the epidemic not only in Arabia, Persia, and the Euphrates Valley, but its subsequent conveyance onward by Mohammedan pilgrims from the Levant, Algeria, Southern Russia, and Bosnia, returning to their homes on the shores of the Mediterranean and Black Sea and the valley of the Danube; the more so, as ten cases have already been detected in the port of Marseilles.

II.

ITS GERM AND TRANSMISSION.

BY ALVAH H. DOTY, M.D.,
HEALTH OFFICER OF THE PORT OF NEW YORK.

THE appearance of the bubonic plague in the East during the past two years finds the world, for the first time, prepared to investigate scientifically the cause of its development and indicate the means of relief. The investigations undertaken have already in a measure been successful, and the value of the results will be better appreciated after reviewing the past history of the plague, which shows the complete helplessness heretofore of the people and the authorities to restrict its ravages.

There is no doubt as to the antiquity of the bubonic plague, which has during the past two thousand years been variously described by writers under the name of Levantine, Oriental, or Bubonic Plague, and the Black Plague or Black Death, etc. These designations are open to criticism, as they are more or less misleading and without scientific foundation. Different names have been suggested by the more recent writers; malignant polyadenitis has recently been presented by Dr. Cantlie, of

London. This at least has the merit of indicating the local manifestation of the affection.

The first authentic description of the bubonic plague is contained in the writings of Rufus, of Ephesus, who described the disease as having existed in Northern Africa during the third or fourth century B. C., and presented the testimony of physicians of this period to corroborate his statements.

It is evident that Egypt was considered the home of the plague. During the reign of Justinian, in the year 542 A. D., the disease appeared in Egypt, and within a year extended to Constantinople, where it is said to have caused the death of 10,000 persons in one day. Within a short period it appeared in Italy and Gaul. It is fair to assume that the numerous "pestilences" which are referred to by Bede as occurring in England between the years 660 and 680 were epidemics of bubonic plague. Although the plague appeared in the centuries which followed the above dates, the next great outbreak which has been carefully described occurred in the fourteenth century, and was known as the "black plague" or "black death." It is hard to conceive of the terrible ravages caused by the plague during this time. It was brought from the East, and was supposed to have had its origin in China in 1334; thence it invaded India, Persia, Russia, and subsequently Poland, Germany, France, Italy, and Spain. It was believed by some writers of that day to have been introduced into Europe by the survivors of an expedition who landed at Genoa from the Crimea, a number of the party having died during the passage from a disease which was regarded as the plague. The disease appeared in Sicily in 1346; in England in 1349; and in Norway in 1351. Nearly the whole of Europe was invaded by this epidemic. In 1352 Oxford lost two-thirds of its academical population. It is estimated by Hecker that one-fourth of the population of Europe, or 25,000,000 persons, died of the plague during this reign of terror; 50,000 died in Paris; and out of 2,000,000 inhabitants in Norway but 300,000 survived. The same appalling results followed its appearance in London, Venice, and other cities of Europe. It was estimated by Pope Clement VI. that the mortality from the "black death" for the entire world was over 40,000,000. This outbreak lasted about twenty years. The plague again appeared in Europe during the fifteenth and sixteenth centuries. During the latter period (sixteenth century) China was almost depopulated. In 1656 the plague appeared in Naples, and in five months caused 300,000 deaths. During the same time the mortality in Rome was but 1400. This is of interest, inasmuch as the reduced mortality in the latter city was attributed to the sanitary precautions taken by Cardinal Gastaldi.

The great plague of London made its appearance in 1664, and lasted about one year. During this period there were 63,596 deaths

out of a population of 460,000. Hodges believed that the infection causing this outbreak was introduced by bales of merchandise from the Levant. The sanitary condition of London at this time was notoriously bad. It is a significant fact that those who lived out of town, on barges and ships in the river Thames, at this time, did not contract the disease. The outbreak was particularly destructive to the lower classes, and was known as the "Poor's Plague." Dr. George Thompson, a London physician, is said to have contracted the disease in the dissecting-room, although it is recorded that numerous post-mortems made during this period were without danger to the surgeon. No epidemic of plague appeared in London after 1666, although occasional cases were reported until 1679. In 1666 the disease invaded Cologne, and districts along the Rhine; and extended to the Netherlands in 1667-'69. It reappeared in France in 1720. In the period between 1675 and 1684 a new epidemic traversed the north of Africa and extended to Turkey, Poland, Hungary, Austria, and Germany, and then progressed northward. In 1679 there were 76,000 deaths in Vienna, and in 1681 Prague lost 83,000 of its population from the same cause.

During the eighteenth century the plague existed only in Eastern Europe, Asia, and Africa. Within this period it visited Constantinople several times with more or less disastrous effect. In 1720 a serious outbreak occurred in Marseilles and lasted until the end of 1721. It is estimated that it caused 46,000 deaths. The introduction of the disease into Marseilles was said to have been due to the arrival of a ship from Syria, where the disease prevailed. A severe epidemic occurred during the Russo-Turkish War in 1770 and in 1771. The Moscow epidemic was one of the most destructive of modern times; about 25 per cent. of the population of that city succumbed to the disease. During the end of the eighteenth and the beginning of the nineteenth century twenty-one outbreaks of the plague occurred in Egypt. Severe epidemics occurred in Constantinople during the early part of the present century. It appeared in Armenia a number of times between 1828 and 1843. The outbreaks which took place in Malta in 1813 and in Corfu in 1815 were probably due to the infection brought from the East. In 1828 an epidemic occurred in Greece, which is understood to have been introduced by troops coming from Egypt. With the exception of a slight outbreak in Dalmatia in 1840, and a severe one on the Volga, in the province of Astrakan in Russia, in 1878 and 1879, the disease has not again appeared on the continent of Europe, nor has it appeared in Egypt since 1845. Between 1853 and 1879 the plague appeared several times in Arabia, and in 1878 was within a short distance from Mecca. In 1858 a small outbreak occurred in Tripoli, at which place it reappeared in 1859 and 1873, but did not spread.

In 1867 the plague appeared in Mesopotamia (Iraq) and prevailed

at intervals until 1885. A severe epidemic occurred in 1873 in this vicinity, and in 1874 it appeared further south at Divanieh. In 1876 it travelled northward and appeared at Bagdad; in 1877 it appeared at Shuster in Southwestern Persia, having been conveyed to this place by pilgrims returning from Irak.

In 1815 the plague appeared in India, showing itself in the provinces of Gujerat, Kattywar, and Cutch, "after three years of famine." During the next year it travelled to the northwest and broke out in Sind, and afterward extended in a southerly direction, but disappeared about 1820. However, it reappeared in 1836 in a severe epidemic at Pali in Marwar in Rajputana and lasted until the following year, 1837. Since then it has not appeared in this part of India.

In 1823 the disease broke out southwest of the Himalayas, and other outbreaks occurred in this vicinity in 1834, 1836, 1849, 1850, and in 1852, and also in 1856 and 1877.

In China the plague has been endemic in the provinces of Pakhoi and Lienchu since 1871. From these localities it was transplanted to Canton and Hong-Kong in 1894. The mortality in the former place was 180,000. It was during this epidemic that the French physician Yersin and the Japanese physician Kitasato made their bacteriological researches, which constitute the only scientific information we possess regarding the bubonic plague.

BACILLUS OF THE BUBONIC PLAGUE. The bacillus of the bubonic plague (*bacillus pestis bubonicæ*) was discovered and studied by Kitasato and Yersin, working independently at about the same time (1894), during the epidemic of the plague at Hong-Kong. It is found in large numbers in the pus from the buboes characteristic of this disease, in the lymphatic glands, and occasionally in the internal organs. It is apparently present in the blood only in acute hemorrhagic types of the disease and shortly before death. It has been isolated from these parts in human beings suffering from the disease; has been cultivated on artificial media; and a disease resembling it in all particulars has been produced in animals by inoculation with the cultures. Further, the organism has not been found in any other infectious disease, and it may be, therefore, fairly assumed that the bubonic plague is produced by this specific bacillus. It is pathogenic in many animals, and during epidemics rats, mice, and flies in large numbers become infected and die, and the disease is apparently transmitted through them. It has also been found in the feces, in the dust of infected houses, and in the soil.

The bacillus occurs in the form of short, thick rods, rounded at the ends, somewhat motile, and occasionally in chains, often surrounded by a capsule. It stains well with the aniline-dyes, the ends being more deeply colored than the central portion. It does not form spores, and grows abundantly upon blood-serum at the body-temperature, the

growth appearing on the surface after twenty-four to forty-eight hours, in the form of white, moist, transparent, and iridescent colonies. On gelatin it grows slowly along the track of the wire in stab-cultures, and on the surface of the medium at a temperature of 18° to 20° C. It grows rapidly on glycerin-agar, forming a grayish-white surface-growth. In bouillon a very characteristic appearance is produced, resembling that seen in cultures of the streptococcus of erysipelas—that is, the culture-medium appears clear with white granular or grumous deposits on the walls and in the bottom of the tube. This bacillus is pathogenic for rats, mice, guinea-pigs, and rabbits, which usually die within two or three days after inoculation. Then at the point of inoculation are found a somewhat hemorrhagic infiltration and œdema, with enlargement of the neighboring lymph-glands, hemorrhages into the peritoneal cavity, and congestion of the parenchymatous organs. The spleen sometimes shows minute nodules resembling miliary tubercles. Microscopically the bacilli are found in all the organs and in the blood. The disease is rapidly communicated from one animal to another, and thus its extension is facilitated.

The virulence of the bacilli in cultures and in nature seems to vary considerably, and is rather rapidly lost when grown on artificial media. The growth in cultures becomes more abundant after frequent transplantation. The virulence of the organism is increased by successive inoculation in certain animal species, and then its pathogenic properties for other species are less marked.

THE ANTI-PLAGUE SERUM. Yersin, Calmette, and Borrell (*Annales de l'Institut Pasteur*, 1895) succeeded in immunizing animals against the bacillus of bubonic plague by the repeated intravenous or intraperitoneal injection of dead cultures or by subcutaneous inoculation. They also succeeded in immunizing a horse in about six weeks; so that the serum afforded protection to small animals after subcutaneous injection of virulent cultures, and even cured those which had been previously infected, if administered within twelve hours after the inoculation.

A more recent report (*Bull. de l'Acad. de Méd.*, 1896) shows that Yersin has successfully applied the same treatment to man for the cure of the plague.

The first case treated was a young Chinaman at the Catholic Mission at Canton, June 26, 1896, who was attacked with a severe type of the disease. He received three injections of the serum (10 c.cm. each) and recovered. The Consul-General of France at Canton telegraphed June 29th to the Minister of Foreign Affairs thus: "I have the honor to inform your excellency that Dr. Yersin has applied his serum to a Catholic Chinaman severely ill of the plague. Absolute success."

Dr. Monod, Director of Public Health in Paris, September, 1896, presented the following communication to the Academy of Medicine:

"After Dr. Yersin's departure from Canton the French Consul at Hong Kong, M. Chausse, performed the same operation upon two other pupils at the Mission who had the plague, and cured them. Having been informed that there were many cases of plague at Amoy, Dr. Yersin went thither on July 2d. He remained there ten days, during which time he treated twenty-two cases by subcutaneous injection of serum prepared in the Pasteur Institute in Paris, and cured twenty of them. If these statements are true, it may be accepted that the value of Dr. Yersin's serum is assured."

It is believed that the plague is transmitted solely through infection from previous cases. What part, if any, the soil plays in propagating the disease has not yet been settled. The natives of Eastern countries where the plague is prevalent are strongly impressed with the belief that the germ is contained in the ground. If this view is confirmed, it may in a measure explain why the infection of rats, etc., precedes or is present during an outbreak in the human being. The constancy with which this occurs deserves more than a passing notice. There is very little doubt that the bacillus discovered by Kitasato and Yersin is found in all cases of the disease in rats occurring during an epidemic of the plague. The rats are, as a rule, stricken before the inmates of the house are affected, and are frequently found dead in the different apartments. Their presence in the interior is regarded as a bad omen—a precursor of the disease. Dr. Cantlie discusses this matter in a very able article published in the *London Lancet* of January 9, 1897. Other animals, such as the pig and dog, are similarly affected, but not to the same extent as rats. Purely herbivorous animals are not attacked.

Exactly what influence climate and temperature have in the propagation of the plague, we do not know. We do know, however, that hot, dry air is fatal to the disease, and that moist, warm air is favorable to it. It even may be very active in cold weather; this was shown in the outbreak which occurred on the Volga in the severe winter of 1878. Like typhus fever, it is unknown in the tropics, and, like this disease, it usually selects its victims from the lowest class and thrives on filth and famine.

INCUBATION. From three to six days may be regarded as the period of incubation; the time rarely, if ever, extends beyond this. In malignant cases the disease may show itself within twenty-four hours after the exposure.

SYMPTOMS. The bubonic plague may assume a mild character (pestes minor) and not seriously interfere with the daily occupation of the patient, and may continue over a period of two or three weeks or longer. A slight rise of temperature is noticeable, associated with a swelling of the glands, principally in the groin and armpit, which may or may not suppurate. Cases of this variety almost always recover. The course which this form runs is so mild that its identity with the typical form

of bubonic plague has been questioned. However, recent investigations have shown the identity of the two forms.

In the usual or severe form (*pestes major*) the early symptoms are similar to those which usher in typhus fever: the invasion being abrupt, associated with chills, great depression, blunted condition of the intellect, pains in the bones, high fever, etc. In rapidly fatal cases the glandular swellings may not occur. In the ordinary cases, however, they are almost always present, occurring principally in the groin and axilla, and occasionally in the neck and other regions. In some outbreaks carbuncles have been found in 2 or 3 per cent. of the cases; hemorrhages from the respiratory and alimentary tracts occur.

Hemorrhage from the respiratory or alimentary tract and petechial or hemorrhagic spots on the skin are looked upon as infallible signs of approaching death. The mortality varies in different epidemics, and is variously estimated at from 50 to 90 per cent. The disease, as it existed in Hong-Kong in 1894, when Yersin made his researches, is said by him to have presented all the symptoms and clinical features of the plague of the middle ages, and is thus described by him: "Onset abrupt; after an incubation of from four and one-half to six days, accompanied by weakness and prostration, the attack comes on suddenly with high fever, frequently attended by delirium. From the first day a specific bubo, unique in appearance, is observed in 75 per cent. of the cases in the groin, in 10 per cent. in the armpit, rarely on the neck or in other parts of the body. The lymph-glands rapidly enlarge to the size of a hen's egg. Death frequently occurs within forty-eight hours, and often earlier. When life is prolonged for five or six days the prognosis is more favorable: the bubo softens, and it may be operated on to allow the pus to escape. In some cases the bubo has not time to form; then hemorrhages take place into the mucous surfaces, or petechiæ appear on the skin. The mortality is enormous—95 per cent. in the hospitals."

It seems strange that a reappearance of the disease, which since the beginning of the Christian era has been so terribly destructive to human life, should be regarded with such apathy by the European powers as to allow it to gain its present headway in India. It is evident that the lesson taught by the ravages of previous epidemics has been unheeded. It is only within the past few weeks that any semblance of concerted action has been taken to stamp out the plague. What progress it may yet make in the East, or what probability exists of the disease reaching Europe overland, cannot be determined, and depends largely on the action of the sanitary authorities abroad. Of the numerous avenues by which the plague may reach Europe, the Suez Canal is one of the most important, and it is fortunate that the Egyptian government has a well-appointed sanitary station on this route; in fact, there are two, one at El Tor, on the southern coast of the Isthmus of Suez opposite and below

the town of Suez, and one at Suez, the entrance of the canal. At the former place provision is made for the reception of a large number of persons either sick or held for observation, with apparatus for disinfection by steam, etc. All vessels arriving at this place are inspected and detained if any evidence of infection is present. After release from this point the vessel is again examined at Suez, and, if found to be in good condition, is allowed to pass through the canal. The distance from Bombay or other Indian ports is so great that the longest possible period of incubation of the plague would be more than covered during the passage between these places. It is, therefore, evident that an infected person embarking at Bombay would develop the disease long before reaching El Tor. It is to be hoped that the present quarantine regulations of the Egyptian government will include the thorough disinfection of all ships, clothing of passengers, bedding, etc., which arrive from India, whether cases of illness have occurred on board or not. This would prevent the carrying of infected material to European ports, and, if effectively carried out, would render valuable aid in preventing the introduction of the plague into Europe by water.

The short period of incubation in this disease is also one of our great safeguards, as the time occupied in a passage to this country from a Mediterranean port would more than cover the period of incubation. This might also be said in regard to the passage from any European port. If an outbreak of this disease should occur on shipboard during the voyage, it would be made known to the quarantine officer on the arrival of the ship, which would be held for disinfection, the passengers and crew being treated as the occasion demands. There remains, however, an element of danger which unfortunately cannot very well be estimated, as our knowledge on this is meagre and unsatisfactory. I refer to the transmission of the disease by clothing, articles of merchandise, etc. It is this possibility which confronts the health officials, and constitutes a difficult and unpleasant problem. In view of the uncertainty which exists regarding the latter, it would seem imperative that every precaution should be taken to disinfect carefully and properly every piece of material which may be regarded as a menace to health.

With the improved and effective forms of apparatus for disinfection by heat which are now available, and the good results which are being obtained from the use of formaldehyd, no infected materials should gain entrance to this country, as no port of entry should be without the proper equipment for the treatment of possibly infected matter.